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|-------|------|------------------------------------|---|------------------|---------|------------------|
| L1 | 161 | VSAM and UNIX | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 14:51 |
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| L3 | 21 | 1 and 2 | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 14:51 |
| L4 | 5 | 3 and bypass\$3 | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 14:52 |
| L5 | 5 | 4 and port\$3 | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 15:44 |
| L7 | 447 | "shell interface" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 15:55 |
| L8 | 2 | 7 same bypass\$3 | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 15:45 |
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| L10 | 64 | "shell interface".clm. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 15:56 |

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| L11 | 4709 | "access command" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 15:55 |
| L12 | 697 | "access command".clm. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 15:55 |
| L13 | 0 | 10 and 12 | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 15:55 |
| L14 | 697 | "access commands".clm. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 15:56 |
| L15 | 59599 | shell.clm. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 15:56 |
| L16 | 2 | 14 and 15 | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 16:00 |
| L17 | 0 | 16 and queue.clm. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 16:00 |
| L18 | 0 | 16 and queue\$3.clm. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 16:00 |
| L19 | 7258 | (707/100,101,200).CCLS. | US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2005/12/08 16:01 |
| L20 | 1361 | (710/5,6,24).CCLS. | US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2005/12/08 16:01 |

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| L21 | 8612 | 19 or 20 | US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 16:02 |
| L22 | 11 | 21 and 7 | US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 16:12 |
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| L24 | 2 | 22 and queue\$3 | US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 16:29 |
| L25 | 1586 | (711/112).CCLS. | US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2005/12/08 16:29 |
| L26 | 1068 | (719/328).CCLS. | US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB | OR | OFF | 2005/12/08 16:29 |
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| L30 | 54 | 29 and queue\$3 | US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 16:32 |
| L31 | 11 | 30 and "operating system" | US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 16:34 |
| L32 | 1 | 31 and shell | US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2005/12/08 16:34 |



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James M. Butler, A. Yavuz Oruc

January 1990 **Proceedings of the 1990 ACM annual conference on Cooperation**

Publisher: ACM Press

Full text available: [pdf\(770.21 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

There are many areas of investigation where it is necessary to model the structure and behavior of distributed programs. Many models exist, though most tend to focus on some particular aspect of program behavior. For many problems, such as task mapping in real-world systems, it is necessary to coalesce all major features of distributed program structure and behavior into a single model. This paper presents a model called a Program Structure and Behavior graph which provides a basis for simu ...

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W. T. C. Kramer, J. M. Crower

August 1989 **Proceedings of the 1989 ACM/IEEE conference on Supercomputing**

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3 [A novel application development environment for large-scale scientific computations](#)



X. Shen, W. Liao, A. Choudhary, G. Memik, M. Kandemir, S. More, G. Thiruvathukal, A. Singh

May 2000 **Proceedings of the 14th international conference on Supercomputing**

Publisher: ACM Press

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Our results demonstrate that our novel application development environment provides both ease-of-use and high performance for large-scale, I/O-intensive scientific applications.

4 [Bochs: A Portable PC Emulator for Unix/X](#)



Kevin P. Lawton

September 1996 **Linux Journal**

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5

[UIO: a uniform I/O system interface for distributed systems](#)





David R. Cheriton

January 1987 **ACM Transactions on Computer Systems (TOCS)**, Volume 5 Issue 1

Publisher: ACM Press

Full text available:  [pdf\(3.20 MB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

A uniform I/O interface allows programs to be written relatively independently of specific I/O services and yet work with a wide variety of the I/O services available in a distributed environment. Ideally, the interface provides this uniform access without excessive complexity in the interface or loss of performance. However, a uniform interface does not arise from careful design of individual system interfaces alone; it requires explicit definition. In this paper, the UIO (unifo ...

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UIO: A Uniform I/O System Interface for Distributed Systems

DAVID R. CHERITON
Stanford University

A uniform I/O interface allows programs to be written relatively independently of specific I/O services and yet work with a wide variety of the I/O services available in a distributed environment. Ideally, the interface provides this uniform access without excessive complexity in the interface or loss of performance. However, a uniform interface does not arise from careful design of individual system interfaces alone; it requires explicit definition.

In this paper, the UIO (uniform I/O) system interface that has been used for the past five years in the V distributed operating system is described, with the focus on the key design issues. This interface provides several extensions beyond the I/O interface of UNIX¹, including support for record I/O, locking, atomic transactions, and replication, as well as attributes that indicate whether optional semantics and operations are available. Experience in using and implementing this interface with a variety of different I/O services is described, along with the performance of both local and network I/O. It is concluded that the UIO interface provides a uniform I/O system interface with significant functionality, wide applicability, and no significant performance penalty.

Categories and Subject Descriptors: D.4.4 [Operating Systems]: Communications Management—input/output

General Terms: Design, Experimentation, Performance, Standardization

Additional Key Words and Phrases: Byte stream, distributed system, files input/output, interface, interprocess communication, remote procedure call

1. INTRODUCTION

A *uniform I/O interface* specifies the syntax and semantics for a set of I/O operations that are provided in a sufficiently similar form across the I/O services of an operating system such that programs can be written to be relatively independent of the data sources and sinks to which their I/O operations are eventually bound. A familiar example of such an I/O interface is the UNIX I/O interface [29]¹ consisting of the system calls open, read, write, seek, close, and

¹ UNIX is a trademark of AT&T Bell Laboratories.

This work was supported in part by the Defense Advanced Projects Agency under contracts MDA 903-80-C-0102 and N 00039-83-K-0431, by Digital Equipment Corporation, and by the National Science Foundation. The initial work was supported by the Natural Sciences and Engineering Research Council of Canada.

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